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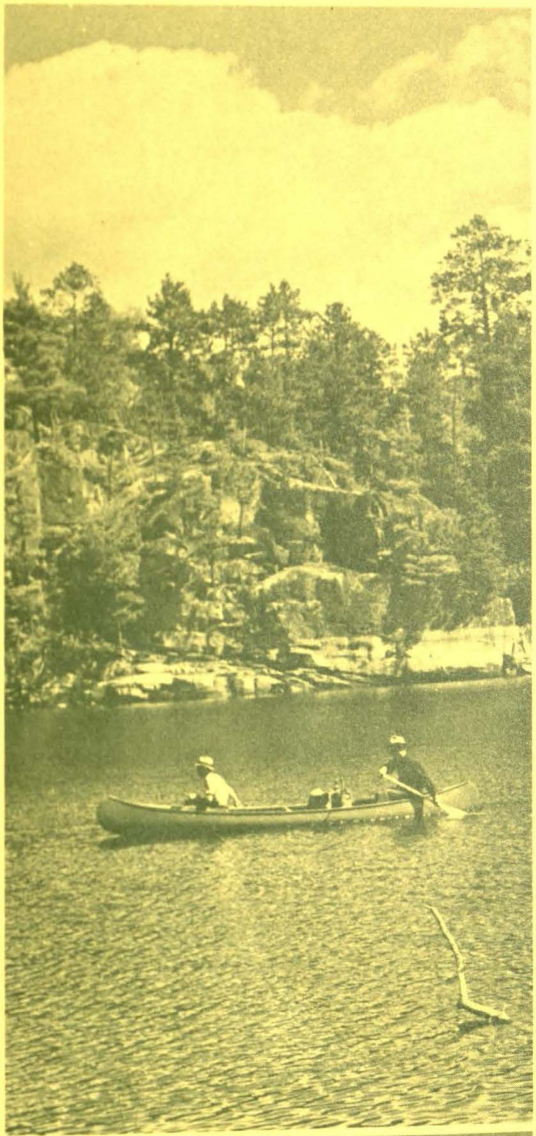
IMPROVING ESTIMATES OF WILDERNESS USE FROM MANDATORY TRAVEL PERMITS



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IMPROVING ESTIMATES OF WILDERNESS USE FROM MANDATORY TRAVEL PERMITS

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and

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The recreational use of Forest Service Wilderness and Primitive Areas and other roadless and dispersed recreation areas is rapidly growing. The problems caused by this growth are well known to public land managers and visitors to these areas. In parts of some roadless areas, visitors are encountering each other too often and enjoying their experiences less. Campsites are harder to find, and many are showing evidence of overuse. Consequently, managers and visitors increasingly support the establishment of controls over use.

Information on the recreational use of wildland areas is important for management of these areas. Data are required on both the amount and nature of use. Estimates of wilderness use are among the least valid and reliable of all forest recreation use figures (Lucas, Schreuder, and James 1971). Self-registration data have helped managers make better estimates, but the fact that many visitors do not register has led to recommendations for mandatory permits in all wilderness to provide better data on use (Hendee and Lucas 1973).

By the end of 1973, permits were mandatory on 43 of the 89 Forest Service Wilderness and Primitive Areas. They were first required in the Boundary Waters Canoe Area (BWCA) in 1966. They are also required in some National Parks; the first was Rocky Mountain in 1968.

Even where permits are mandatory, some groups still fail to obtain them and thus the Wilderness Area gets more use than the permit data show. We found that a study of these groups can help managers improve estimates of use and increase compliance in permit areas.

The objectives of our study were: (1) to determine the number of visitors who did not have permits, (2) to find out how groups that did not obtain permits differed from those that did, (3) to determine a method to improve estimates of wilderness use by adjusting permit data, and (4) to make recommendations for obtaining better permit compliance.

We collected data on permit compliance in the BWCA during a larger 1971 study of carrying capacity.[1/] Personal interviews were held with 1,352 groups of BWCA visitors between May 14 and September 6, 1971. Groups were interviewed at access points outside the BWCA before they began their trip and then given a "BWCA Trip Diary" to keep a daily log of their experience.

PERMIT COMPLIANCE

Overall, 88 percent of the groups had a permit at the time they were interviewed (table 1). This is higher than in earlier studies of visitor compliance with wilderness self-registration systems in which between 67 and 75 percent of the parties registered (Wenger 1964; Wenger and Gregersen 1964; Lucas, Schreuder, and James 1971). Groups without a permit were issued one by the interviewer.

Four reasons may account for this high degree of compliance in comparison with self-registration systems. First, the permit is mandatory whereas self-registration is optional. Citations are issued by the Forest Service for failure to have the mandatory permit, and fines have reached twenty-five dollars. A crackdown on groups not having a permit has been instituted since 1970. Prosecutions have been publicized by the mass media. The "word is out" to make sure you have a permit.

Second, permits have been required since 1966. Enough time has passed so nearly all local merchants and most visitors know about the permit and the consequences of not having one.

Third, the Forest Service has nine offices and a visitor information center to facilitate groups in obtaining a permit. Over the past three

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1/ *Study objectives, sampling procedures, and other study details are on file at the North Central Forest Experiment Station, St. Paul, Minn.*

Table 1.--Percentage of BWCA groups in compliance with mandatory travel permit regulation, 1971, according to selected group characteristics

Group characteristics	Groups in sample: Number	Groups with travel permit: Percent
Composition**		
Family	712	86
Organizational	140	98
Friends, acquaintances	352	89
Size*		
1 to 2 people	451	87
3 to 4	451	86
5 or more	419	91
Primary mode of travel**		
Paddle canoe	763	92
Motor canoe	195	95
Motorboat	370	76
Length of stay[1]**		
Daytime only[2]	295	73
1 to 2 nights	318	92
3 to 6 nights	520	93
7 or more nights	198	92
Daytime visitors' overnight accommodations**		
Home or home of acquaintance	103	89
Resort	40	78
Public or private auto-access campground	113	58
Use of an outfitter[3]*		
Groups outfitted	480	92
Groups not outfitted	845	86
Primary purpose of visit*		
Fishing	338	84
Other	940	90
Age of leader**		
Under 20 years	112	94
20 to 34 years	618	91
35 to 54 years	469	85
55 or more	87	79
Occupation of leader**		
Professional, technical	559	89
Managers, proprietors	82	85
Clerical, sales workers	91	82
Craftsmen, foremen	178	81
Other labor, service workers	107	84
Student	237	95
Returning BWCA Trip Diary		
Groups that returned Diary	1,093	88
Groups that did not return Diary	238	87
Total	1,352	88

1/ Includes total nights in the BWCA and Canada.

2/ No nights in BWCA, but visit could be for several days.

3/ Outfitted means they rented at least a canoe, boat or motor from an outfitter, resorter or other merchant.

* Chi-square test indicates the difference between groups with a travel permit and those without a permit (not shown) is significant beyond the 0.05 level.

** Differences significant beyond the 0.001 level.

or four years signs telling about the permits have been posted on most major travel arteries. Small signs are posted at each of the seventy access points as well.

Fourth, about a hundred local merchants cooperate with the Forest Service by issuing permits. Most businessmen make sure their clientele know about the permits.

Group Characteristics Related to Permit Compliance

The 12 percent of groups without a permit were different in certain characteristics from groups with a permit. In what characteristics did these two groups differ?

Characteristics Considered Singly

Composition of group.--Youth groups visiting the BWCA under the leadership of an organization had a high compliance rate (table 1). Family parties had the lowest compliance, whereas groups of friends and acquaintances were about equal to the average overall compliance of 88 percent.

Size of group.--Small- and medium-sized parties (1-2 and 3-4 individuals, respectively) had a slightly lower compliance rate than larger groups (table 1). The slightly above-average compliance by larger parties is partly because they are usually organizational groups with an exceptionally high rate of registration (Lime 1972).

Primary mode of travel.--Parties traveling by motorboat were much less likely to have a permit than either paddle canoe or motor canoe parties (table 1).

Length of stay.--Daytime visitors had a permit less often than overnight camping groups (table 1). This was also often noted in studies of self-registration in the West (Wenger 1964; Wenger and Gregersen 1964; Lucas, Schreuder, and James 1971). For visitors who stayed overnight in the BWCA, the number of nights camped made virtually no difference in rate of compliance. Daytime visitors spending their nights in public or private auto-campgrounds (94 percent were in Forest Service camping areas) were less likely to have a permit than were groups staying in either resort-motel accommodations or in their own home or home of a friend (table 1). Presumably, daytime visitors were unaware of BWCA regulations, or if they were aware, felt the probability of being caught was too low to worry about it.

Use of an outfitter or rented equipment.--More groups who rented at least some watercraft equipment had a permit than did groups who did not (table 1). Most local businessmen apparently made sure their clientele knew about the permit.

Purpose of trip.--Groups were asked to select important motives for visiting the BWCA, rather than some other area, from a list of 14 reasons. Parties stating fishing as the most important purpose were less likely to have a permit than were those with other reasons (table 1). This was also a significant characteristic related to self-registration in the western wilderness studies (Wenger 1964; Wenger and Gregersen 1964; Lucas, Schreuder, and James 1971).

Age and occupation of group leader.--Groups in which the party leader was under age 35 more often had a permit than did those with older leaders (table 1). Parties with a teenage group leader had the highest compliance rate. (This is opposite of the findings of the self-registration research.) Groups having a student leader typically had a permit (table 1). Aside from group leaders whose occupation was classified student or professional-technical, all other categories had below-average compliance rates.

Returning the BWCA trip diary.--Just over 80 percent of the diaries distributed were returned. The same return rate was obtained both from groups with a permit and those without (table 1). This suggests groups without permits were not necessarily willfully violating Forest Service rules and regulations. Rather, many--if not most--were simply unaware or unsure of the requirement to have a permit. Interviewers were convinced that the majority of the groups without a permit were not willfully violating the rule. In fact most groups, after we told them they needed a permit, were rather apologetic and very appreciative of being issued one. This appreciation could have assisted us in getting at least some of the diaries back that we otherwise would not have received, but the effect probably was not very great.

Access point.--Groups were studied to learn if those entering certain access points had a lower permit compliance rate than others. Data were collected from 23 of the BWCA's 70 access points and compliance ranged from 70 to 98 percent among places. Access points were classified as to whether they were remote or not remote (based on their distances from main roads, towns, resorts, outfitters). The remote places had a slightly lower compliance (83 percent) compared to the others (89 percent). Access points were also stratified on the basis of the number of groups entering in 1971--heavy, medium, and light use. Virtually no difference was detected among categories.

At only two access points were there significant differences between the "spring fishing season" (ending in mid-June) and remainder of the summer. All locations were combined for each season and then compared. There was no important difference between seasons (87 percent spring and 89 percent summer).

Other visitor characteristics.--Four other characteristics showed no significant differences (at the 0.05 level): (1) travel to Canada during the visit, (2) month of the visit, (3) place of residence of the group leader (local, regional, national), and (4) number of previous visits to the BWCA by the party leader.

Characteristics Considered in Combination

Several of the group characteristics that influenced rate of compliance appeared interrelated. User classes representing the six major visitor characteristics (significant at the 0.001 level, table 1) were cross classified with one another to learn more clearly which factors or combination of factors most influenced compliance.

The cross classification comparisons were made in contingency tables and showed the percentage of visitor groups with permits for each user class. In cases where rates of compliance for individual classes were statistically similar (not implying behavioral similarity), classes were combined. For instance, since both paddle and motor canoe groups had similar compliance rates (92 and 95 percent, respectively), they were combined and compared with motorboat use.

Inspection of the cross classifications indicated that certain characteristics when considered together had more influence on rates of compliance than others. For example, percent of the groups without a travel permit classified by primary mode of travel, and age of group leader, were compared (table 2). Large statistical differences existed between travel modes but not between age classes for each mode of travel. We concluded that mode of travel was more closely related to noncompliance than was age of the party leader.

Organizational groups, which had an exceptionally high rate of compliance (98 percent) were studied in relation to other group characteristics. These groups were typically large (eight or more members) with young leaders, principally students (Lime 1972). These facts may account for the higher rates of compliance of larger groups, young group leaders, and students (table 1).

Some cross classifications showed that characteristics in combination had an important relation to compliance (table 3). Here, differences were large between travel modes, both for overnight and day visitors. Further analysis of day visitors by mode of travel indicated substantial differences in rates of compliance among groups staying overnight at their home (or home of an acquaintance) and those staying at a campground or resort.

Inspection of cross classifications yielded seven distinct user groups based on one or more of four user characteristics. The four user characteristics were: (1) compositon of the group (organizational and nonorganizational), (2) length of stay (overnight and daytime use), (3) primary mode of travel (canoe and motor-

Table 2.--Number and percentage of BWCA groups with mandatory travel permit by mode of travel and age of group leader, 1971

Age of group leader (years)	Mode of travel: Canoeists (paddle and motor): Total groups in sample	Canoeists (paddle and motor): Groups with permit: Number	Canoeists (paddle and motor): Groups with permit: Percent ±2SE	Motorboaters: Total groups in sample	Motorboaters: Groups with permit: Number	Motorboaters: Groups with permit: Percent ±2SE	All combined: Total groups in sample	All combined: Groups with permit: Number	All combined: Groups with permit: Percent ±2SE
34 and under	592	551	93 ± 2	109	90	83 ± 7	701	641	91 ± 2
35 and older	334	306	92 ± 3	248	183	74 ± 6	582	489	84 ± 3
Total	926	857	93 ± 2	357	273	76 ± 4	1,283	1,130	88 ± 2

Table 3.--Number and percentage of BWCA groups with mandatory travel permit by mode of travel and length of stay, 1971

Length of stay	Mode of travel: Canoeists (paddle and motor): Total groups in sample	Canoeists (paddle and motor): Groups with permit: Number	Canoeists (paddle and motor): Groups with permit: Percent ±2SE	Motorboaters: Total groups in sample	Motorboaters: Groups with permit: Number	Motorboaters: Groups with permit: Percent ±2SE	All combined: Total groups in sample	All combined: Groups with permit: Number	All combined: Groups with permit: Percent ±2SE
Overnight	857	810	95 ± 2	179	147	82 ± 6	1,036	957	92 ± 2
Daytime[1/]	101	78	77 ± 8	191	135	71 ± 7	292	213	73 ± 5
Total	958	888	93 ± 2	370	282	76 ± 4	1,328	1,170	88 ± 2

1/ No nights spent in BWCA, but visit could be for several days.

boat), and (4) daytime visitors' overnight accommodations (home and campground or resort). The seven user groups were:

1. Organizational groups.[2/]
2. Overnight canoeists (paddle and motor).
3. Overnight motorboaters.
4. Daytime canoeists staying at home.
5. Daytime canoeists staying at a campground or resort.
6. Daytime motorboaters staying at home.
7. Daytime motorboaters staying at a campground or resort.

Rates of permit compliance for each group were computed (table 4). The results clearly confirmed that certain groups of visitors were more likely to have a permit than were others. Groups classified as organizational, overnight canoeists, or daytime canoeists staying at home had relatively high rates of compliance (94 to 98 percent). Conversely, daytime canoeists and motorboaters staying at a campground or resort had much lower rates of compliance (60 to 68 percent).

Table 4.--Number and percentage of groups with mandatory travel permit in seven BWCA user groups, 1971

User group	Total groups in sample	Groups with travel permit	
	Number	Number	Percent ± 2SE
Organizational	140	137	98 ± 2[1/]
Overnight canoeists	711	668	94 ± 2
Overnight motorboaters	172	141	82 ± 6
Daytime canoeists staying at home	26	25	96 ± 8[1/]
Daytime canoeists staying at a campground or resort	73	50	68 ± 11
Daytime motorboaters staying at home	75	65	87 ± 8
Daytime motorboaters staying at a campground or resort	107	64	60 ± 9

1/ Confidence limits (95 percent) should be obtained from binomial tables (e.g., Mainland et al. 1956) otherwise two standard errors gives a good approximation.

A METHOD OF ESTIMATING WILDERNESS USE BY ADJUSTING FOR NONCOMPLIANCE

Wilderness use can be more accurately estimated by multiplying the number of groups obtaining permits by an appropriate expansion factor. Individual expansion factors (EF) are derived from the formula

$$EF = \frac{1}{1 - p}$$

where p is the percentage of visitor groups without permits in that use class. Estimates of actual total use for each use class (N) would then be determined from the formula

$$N = n \cdot EF$$

where n is the total number of visitor groups with permits in the use class computed for completed permits.

Individual expansion factors are more valuable for estimating various types of use in an area than for total use. If an estimate of total use is all that is desired by an administrator, he can obtain it by expanding the raw permit data by the percentage of all groups without a permit (in our study, a straight expansion of 12 percent). More likely, however, managers will be interested not only in total use but the *nature of use* as well. Individual expansion factors, then, should be used and individual use estimates summed for total use.[3/] A general expansion factor, such as 12 percent, should not be applied to individual types of use.

Expansion factors both for total use and for various user groups would probably change with time. Wilderness managers would want to keep abreast of shifts in the proportion of use by different user groups as well as changes in the rate of permit compliance.

Estimates of use for each of the seven BWCA user groups in table 4 would be determined by multiplying permit totals by the following expansion factors:

User group	Expansion factor EF ± 2SE
Organizational	1.02 ± .03
Overnight canoeists	1.06 ± .02
Overnight motorboaters	1.22 ± .09
Daytime canoeists staying at home	1.04 ± .08
Daytime canoeists staying at a campground or resort	1.46 ± .23
Daytime motorboaters staying at home	1.15 ± .10
Daytime motorboaters staying at a campground or resort	1.67 ± .03

For example, let us assume there were 650 groups registered as overnight motorboaters. Expanding by the appropriate factor (1.22) gives an estimated 793 actual groups. Two standard errors (±.09) means that actual use, based on a 95 percent confidence interval, would be no less

2/ Includes all organizational groups. The remaining six user groups are composed of nonorganizational groups (families, friends, or acquaintances).

3/ The standard error would be calculated separately for total use.

than 736 or more than 850 groups.[4/] Total use can be estimated by multiplying the appropriate expansion factor and the raw totals for each of the other user groups and then summing them.

Applying the Method to the Present BWCA Permit System

Some of the group characteristics related to compliance are not printed on the BWCA permit. Consequently, not all expansion factors derived from our subsample survey could be used to expand raw BWCA permit data. Four user groups can be identified from the permit, however (fig. 1). These are: primary mode of travel (canoe and motorboat), and length of stay (overnight and daytime use). The four combinations of user groups differed significantly in rates of compliance. Expansion factors were calculated for each group (table 5).

IMPROVING PERMIT COMPLIANCE AND ESTIMATES OF WILDERNESS USE

For the portion of the year we studied BWCA use, compliance with the permit system was indeed good. We feel reasonably sure the fundamental reason many groups did not have a permit was because they were unaware or uncertain of the regulation rather than being hostile to Forest Service rules.

Efforts to improve compliance should be directed to better informing visitors and both local and regional merchants about the permit requirement. It should also be explained *why* permits are necessary for better wilderness management. Visitors and merchants will more readily accept and support management requirements once they understand how permits benefit both the wilderness and themselves.

Daytime visitors staying in resorts and Forest Service campgrounds peripheral to the BWCA are particularly negligent. Although nearly all resort operators are aware of the permit requirement, some are apparently neglecting to inform their guests. As surveillance increases in association with the anticipated use of control measures, particularly in parts of the BWCA where surveillance is now light, the word will undoubtedly get out and compliance will improve. It would be desirable in the meantime, however, to increase the flow of information among concerned parties and avoid at least some of the ill feelings and misunderstanding associated with formal citations.

4/ The confidence limits are based on a normal approximation and not suitable for small samples. A more refined method involves getting confidence limits for p from tables (Mainland et al. 1956, page X, Tables V and VI), and then obtaining the corresponding limits for the expansion factor by $CF = \frac{1}{1-p}$.

SUPERIOR NATIONAL FOREST
BOUNDARY WATERS CANOE AREA

SINGLE TRIP TRAVEL PERMIT

FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

PERMIT NUMBER (4-8) 09301 | ISSUING STATION NUMBER (9-11) | YEAR (12-13) 19

NAME - PRINT LAST NAME | FIRST NAME | MIDDLE INITIAL

ADDRESS STREET AND NUMBER

CITY | STATE | ZIP CODE (14-18)

THERE WILL BE (19-20) PEOPLE IN MY PARTY. WE PLAN TO SPEND (21-22) DAYS IN THE B. W. C. A. AND (23-24) DAYS IN CANADA, WE WILL START MO. (25-26) DAY (27-28) FROM ENTRY POINT NO. (29-30)

WE WILL TRAVEL IN ZONE NO'S (SEE MAP)

(31-42)

(43-54) WE WILL CAMP

(SHOW NO. OF NIGHTS IN EACH ZONE BELOW THE ZONE NO.)

WE PLAN TO TRAVEL PRIMARILY BY: (CHECK ONE ONLY)

(55) 1 ☐ CANOE NO MOTOR 2 ☐ CANOE WITH MOTOR 3 ☐ MOTORBOAT 4 ☐ SNOWMOBILE 5 ☐ HIKING 6 ☐ OTHER

I AGREE, as party leader, to abide by the rules listed on the reverse side of this permit, and to assure that other party members follow these rules.

SIGNATURE OF PERMITTEE

SEE RULES ON REVERSE

PART 2 — To be completed by issuing officer
This permits the above named individual and party to travel over and use National Forest land in the Boundary Waters Canoe Area.

DATE | SIGNATURE OF ISSUING OFFICER

RETURN OF THIS PERMIT IS NOT REQUIRED

ORIGINAL STAYS IN BOOK — YOUR PERMIT IS YELLOW COPY

Figure 1.--Mandatory travel permits have been required in the BWCA since 1966. They are issued by the Forest Service and regional and local merchants.

Table 5.--Number and percentage of groups with mandatory travel permits and expansion factors for four BWCA user groups, 1971

User group	Total groups in sample	Groups with travel permit		Expansion factor
	Number	Number	Percent	EF ± 2SE
Overnight canoeists	865	818	95 ± 1	1.06 ± .02
Overnight motorboaters	138	106	82 ± 7	1.21 ± .08
Daytime canoeists	106	82	77 ± 8	1.30 ± .14
Daytime motorboaters	198	142	72 ± 6	1.39 ± .12

Almost all of the groups without permits who stayed in campgrounds were in Forest Service campgrounds. Although signs explaining travel permit requirements are posted in each camping area (usually at the boat launching site), the placement of the signs is not always the best nor are the messages always clear. Some groups

for example, probably do not read this information because they never visit the launch area during their stay, or because they keep their watercraft on shore adjacent to their campsite. Some are probably not sure where the BWCA boundary is when they are on the water. Detailed explanatory maps placed in a central location in the campground could help here. Additional signs placed on the main road leading into the campground and on bulletin boards throughout the camping area should also help.

Forest Service personnel working in peripheral campgrounds, at access points, and on arterial roads could be trained and instructed to increase personal contacts with the public in addition to their regular duties. Personal communication with the public can do much to strengthen support once the public clearly understands *why* certain "people management" actions are necessary.

Even if compliance were increased, some correction of permit data probably would still be required. Expansion factors based on the nature of use not represented in the raw data can be determined from studying a sample of visitors. To sustain accurate estimates of use, subsequent studies would be required when either the nature of use or rate of permit compliance was thought to have changed.

Some group characteristics used to derive expansion factors, such as belonging to an organizational group or overnight accommodations of daytime visitors, cannot be determined from the questions on the BWCA permit. They could, of course, be added to the permit if useful expansion factors could not be derived from the information already available. In other wilderness areas questions could be added if additional characteristics were thought to be important.

CONCLUSIONS

BWCA groups without travel permits are different from parties with permits in certain characteristics. The characteristics most related to compliance are mode of travel, length of stay, where daytime visitors spend their nights outside the BWCA, and whether or not the group is affiliated with an organization. Reasons for noncompliance are not totally clear, but most of the parties probably are either unaware of the need to have a permit or do not entirely understand BWCA use regulations. Efforts to make daytime visitors more aware of the mandatory permit might substantially increase rates of compliance--especially for those spending their nights in peripheral Forest Service camping areas and private resorts.

The method used in the BWCA to improve estimates of visitor use can be used by any wilderness managers. The percent of groups that did not obtain permits is first determined and appropriate expansion factors are applied to those that did get permits. These expansion factors change with time so that periodic studies of noncomplying groups are necessary.

Because permit compliance in the BWCA is so high and permits provide such a good tally of recreation use, we believe the standard Forest Service "Wilderness Permit" recently approved by the Office of Management and Budget (OMB) will be desirable and well accepted by the majority of the visiting public. The several thousand visitors contacted by field interviewers had virtually no complaints about the required travel permit or the information requested.

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